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PCT

FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER  
47161-00031USPX

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO.  
(if known, see 37 CFR 1.5)

09/980430

INTERNATIONAL APPLICATION NO.  
PCT/NL00/00374

INTERNATIONAL FILING DATE  
May 31, 2000

PRIORITY DATE CLAIMED  
JUNE 1, 1999

TITLE OF INVENTION  
COIL CONSTRUCTION FOR AN ELECTROACOUSTIC TRANSDUCER

APPLICANT(S) FOR DO/EO/US

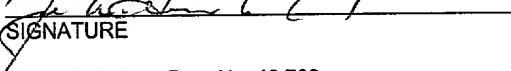
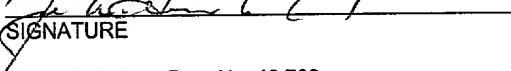
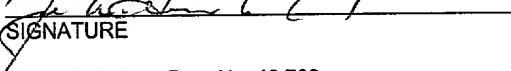
Aart Zeger Van Halteren; Engbert Wilmink, Hendrik Dolleman; Paul Christiaan Van Hal

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1.  This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2.  This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3.  This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4.  The US has been elected by the expiration of 19 months from the priority date (Article 31).
5.  A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a.  is attached hereto (required only if not communicated by the International Bureau).
  - b.  has been communicated by the International Bureau.
  - c.  is not required, as the application was filed in the United States Receiving Office (RO/US).
6.  An English language translation of the International Application as filed (35 U.S.C. 371(c)(2))
  - a.  is attached hereto
  - b.  has been previously submitted under 35 U.S.C. 154(d)(4).
7.  Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a.  are attached hereto (required only if not communicated by the International Bureau).
  - b.  have been communicated by the International Bureau.
  - c.  have not been made; however, the time limit for making such amendments has NOT expired.
  - d.  have not been made and will not be made.
8.  An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9.  An Unexecuted oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10.  An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11.  An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12.  An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13.  A **FIRST** preliminary amendment.
14.  A **SECOND** or **SUBSEQUENT** preliminary amendment.
15.  A substitute specification.
16.  A change of power of attorney and/or address letter.
17.  A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 – 1.825.
18.  A second copy of the published international application under 35 U.S.C. 154(d)(4).
19.  A second copy of the English language translation of the International application under 35 U.S.C. 154(d)(4).
20.  Other items or information:
  - Notification of Transmittal of the International Preliminary Examination Report (PCT Rule 71.1); and
  - PCT International Preliminary Examination Report

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <b>09/980430</b>		INTERNATIONAL APPLICATION NO. <b>PCT/NL00/00374</b>	ATTORNEY'S DOCKET NUMBER <b>47161-00031USPX</b>																																																																																											
21. <input checked="" type="checkbox"/> The following fees are submitted:		<b>CALCULATIONS PTO USE ONLY</b>																																																																																												
<b>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) – (5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... <b>\$1,040.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$890.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$740.00</b>  International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$710.00</b>  International preliminary examination fee (37 CFR 1.482) paid to USPTO And all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100.00</b>																																																																																														
<table border="1"> <tr> <td colspan="4"><b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b></td> <td><b>\$ 890.00</b></td> </tr> <tr> <td colspan="4">Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492)(e).</td> <td><b>\$</b></td> </tr> <tr> <td><b>CLAIMS</b></td> <td><b>NUMBER FILED</b></td> <td><b>NUMBER EXTRA</b></td> <td><b>RATE</b></td> <td><b>\$</b></td> </tr> <tr> <td>Total Claims</td> <td>19 - 20 =</td> <td>0</td> <td>x \$ 18.00</td> <td><b>\$</b></td> </tr> <tr> <td>Independent Claims</td> <td>5 - 3 =</td> <td>2</td> <td>x \$ 84.00</td> <td><b>\$ 168.00</b></td> </tr> <tr> <td colspan="4"><b>MULTIPLE DEPENDENT CLAIM(S) (if applicable)</b></td> <td><b>+</b> <b>\$280.00</b></td> </tr> <tr> <td colspan="4"><b>TOTAL OF ABOVE CALCULATIONS =</b></td> <td><b>\$</b></td> </tr> <tr> <td colspan="4"><input type="checkbox"/> Applicant claims small entity status. 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A duplicate copy of this sheet is enclosed.            d. <input type="checkbox"/> Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. <b>Credit card information should not be included on this form.</b> Provide credit card information and authorization on PTO-2038.         </td> </tr> <tr> <td colspan="4"> <b>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</b> </td> </tr> <tr> <td colspan="4">           SEND ALL CORRESPONDENCE TO:              Daniel J. Burnham            Reg. No. 39,618            JENKENS &amp; GILCHRIST            225 West Washington Street, #2600            Chicago, Illinois 60606            (312) 425-3900 - telephone         </td> </tr> <tr> <td colspan="4">   <b>SIGNATURE</b>            Justin Swindells, Reg. No. 48,733            JENKENS &amp; GILCHRIST            225 West Washington Street, #2600            Chicago, Illinois 60606            (312) 425-3900 - telephone         </td> </tr> </table>				<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>\$ 890.00</b>	Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492)(e).				<b>\$</b>	<b>CLAIMS</b>	<b>NUMBER FILED</b>	<b>NUMBER EXTRA</b>	<b>RATE</b>	<b>\$</b>	Total Claims	19 - 20 =	0	x \$ 18.00	<b>\$</b>	Independent Claims	5 - 3 =	2	x \$ 84.00	<b>\$ 168.00</b>	<b>MULTIPLE DEPENDENT CLAIM(S) (if applicable)</b>				<b>+</b> <b>\$280.00</b>	<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$</b>	<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. 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not been met, a petition to revive (37 C.R. § 1.157 (a) or (b))  
  
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SIGNATURE  
Justin Swindells, Reg. No. 48,733  
JENKENS & GILCHRIST  
225 West Washington Street, #2600

## PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: )  
 Aart Zeger van Halteren )  
 Engbert Wilmink ) Attorney Docket No. 47161-00031USPX  
 Hendrik Dolleman )  
 Paul Christiaan van Hal ) Group Art Unit: Unassigned  
 )  
 Serial No. Unassigned ) Examiner: Unassigned  
 )  
 Filed: November 30, 2001 )  
 )  
 Title: Coil Construction for an )  
 Electroacoustic Transducer )

CERTIFICATE OF MAILING 37 C.F.R. 1.8

Express Mail Label No. EL722095137US

I hereby certify that this paper or fee is being deposited with the United States Postal Service EXPRESS MAIL POST OFFICE TO ADDRESSEE service under 37 C.F.R. 1.10 on the date indicated above and is addressed to: U.S. PATENT AND TRADEMARK OFFICE, P.O. Box 2327, Arlington, Virginia 22202, Attention: Box Patent Application.

11/30/2001

Adrienne White

U.S. PATENT AND TRADEMARK OFFICE  
 P.O. Box 2327  
 Arlington, Virginia 22202  
 Attention: Box Patent Application

PRELIMINARY AMENDMENT

Dear Sir:

This application is a U.S. national phase of International Application No. PCT/NL00/00374, filed May 31, 2000. Prior to examining the subject application, please enter the following amendments to the international application as originally filed.

IN THE SPECIFICATION:

Page 1 as originally filed, line 1, insert the following heading and paragraph before "The invention relates to . . .":

--RELATED APPLICATIONS

This application is a U.S. national phase of International Application No. PCT/NL00/00374, filed May 31, 2000, which is a complete and foreign application of Dutch patent application No. 1012208, filed June 1, 1999.--

Page 1, line 13, delete "WO 91/10243" and insert therefor --U.S. Patent No. 5,610,989--.

Page 2, line 3, delete "WO 91/10243" and insert therefor --U.S. Patent No. 5,610,989--.

Page 2, line 28, delete "WO 91/10243" and insert therefor --U.S. Patent No. 5,610,989--.

Page 3, line 24, delete "Dutch patent application 1004877" and insert therefor -- commonly assigned U.S. Patent No. 6,078,677, entitled "Electroacoustic Transducer With Improved Diaphragm Attachment," which is incorporated herein by reference in its entirety--.

**IN THE CLAIMS:**

Please cancel claims 1-7 as originally filed in the parent PCT application.

Please add new claims 8-26.

--8. A coil assembly for an electroacoustic transducer, comprising:  
a coil having a coil opening defining an axis therethrough; and  
a circuit board wherein at least a portion thereof is positioned against said coil in a substantially perpendicular relationship to said axis.

9. The coil assembly of claim 8, wherein said circuit board is flexible.

10. The coil assembly of claim 8, wherein said circuit board is rigid.

11. The coil assembly of claim 8, wherein said circuit board includes an opening, said opening of said circuit board being substantially aligned with said coil opening.

12. An assembly for an electroacoustic transducer, comprising:  
an armature having a first leg;  
a coil having a coil opening adapted to receive said first leg therethrough; and  
a circuit board having an opening adapted to receive said first leg therethrough,  
said circuit board being attached to said coil.

13. The assembly of claim 12, wherein said armature includes a second leg, said circuit board having a first slot adapted to receive said second leg therethrough.

14. The assembly of 12, wherein said first leg and said second leg are disposed to form a U-shaped armature.

15. The assembly of claim 13, wherein said armature includes a third leg, said circuit board having a second slot adapted to receive said third leg therethrough.

16. The assembly of claim 15, wherein said first leg, said second leg, and said third leg are disposed to form an E-shaped armature.

17. The assembly of claim 12, wherein said circuit board is attached to said coil via an adhesive.

18. The assembly of claim 12, wherein said coil opening and said circuit board opening are dimensioned so as to permit movement of said first leg of said armature in said coil opening and said opening.

19. The assembly of claim 12, wherein at least a portion of said circuit board is substantially perpendicular to said first leg.

20. An electroacoustic transducer, comprising:

a case;

a transducing assembly disposed in said case, including:

an armature having a first leg;

a coil having a coil opening through which said first leg is received;

a circuit board attached to said coil, said circuit board having an opening

through which said first leg is received, said circuit board

including at least one terminal; and

a magnet assembly including a first magnet separated from a second magnet by a gap, said first leg being received through said gap;  
and

connecting means for connecting said first leg to a diaphragm disposed in  
said case.

21. The electroacoustic transducer of claim 20 further comprising a pin connected to  
said at least one terminal of said circuit board, said pin extending through an aperture in  
said case.

22. The electroacoustic transducer of claim 20, wherein said armature includes a  
second leg and a third leg, said circuit board includes a first slot disposed along a first  
outer edge of said circuit board and a second slot disposed along a second outer edge of  
said circuit board, said first slot receiving said second leg and said second slot receiving  
said third leg.

23. The electroacoustic transducer of claim 20, wherein said circuit board is  
substantially perpendicular to said first leg.

24. A method of assembling an electroacoustic transducer assembly, comprising the  
steps of:

providing a coil having a coil opening;

attaching a circuit board to said coil, said circuit board having an opening;

extending an armature leg through said coil opening and said opening; and  
positioning a magnet assembly adjacent to said circuit board such that said  
armature leg extends through a gap between a first magnet and a second magnet.

25. The method of claim 24, further comprising the step of dimensioning said coil  
opening, said opening, and said gap so as to permit movement of said armature leg  
therebetween.

26. A method of positioning a movable armature leg within a coil opening,  
comprising the steps of:

providing a coil having a coil opening therethrough;  
attaching a circuit board to said coil, said circuit board having an opening  
therethrough and at least one slot formed along a peripheral edge of said circuit board;  
and

registering said movable armature leg in said coil opening by passing a support  
leg through said at least one slot.--

## REMARKS

The Applicants have added new claims 8-26. New claims 8-26 are generally  
directed to the subject matter of originally filed claims 1-7, which were indicated as  
allowable by the PCT Examiner, and are believed to be allowable. Attached hereto under  
the caption, "Clean Copy of Pending Claims after Entry of Preliminary Amendment

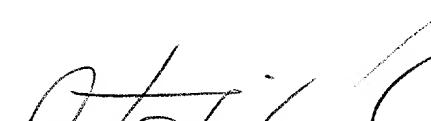
Mailed November 30, 2001," is a clean copy of the pending claims after entry of the present amendment.

### **Conclusion**

The Applicants believe that the claims are allowable over the prior art of record and are in condition for allowance.

If there are any matters which may be resolved or clarified through a telephone interview, the Examiner is respectfully requested to contact the Applicants' undersigned attorney at the number indicated.

Respectfully submitted,

  
\_\_\_\_\_  
Justin Swindells  
Reg. No. 48,733  
Jenkens & Gilchrist  
1445 Ross Avenue, Suite 3200  
Dallas, TX 75202-2799  
(312) 425-3900

Attorney for Applicants

**Pending Claims After Entry of  
Preliminary Amendment Mailed November 30, 2001**

8. A coil assembly for an electroacoustic transducer, comprising:  
a coil having a coil opening defining an axis therethrough; and  
a circuit board wherein at least a portion thereof is positioned against said coil in a substantially perpendicular relationship to said axis.

9. The coil assembly of claim 8, wherein said circuit board is flexible.

10. The coil assembly of claim 8, wherein said circuit board is rigid.

11. The coil assembly of claim 8, wherein said circuit board includes an opening, said opening of said circuit board being substantially aligned with said coil opening.

12. An assembly for an electroacoustic transducer, comprising:  
an armature having a first leg;  
a coil having a coil opening adapted to receive said first leg therethrough; and  
a circuit board having an opening adapted to receive said first leg therethrough, said circuit board being attached to said coil.

13. The assembly of claim 12, wherein said armature includes a second leg, said circuit board having a first slot adapted to receive said second leg therethrough.

14. The assembly of 12, wherein said first leg and said second leg are disposed to form a U-shaped armature.

15. The assembly of claim 13, wherein said armature includes a third leg, said circuit board having a second slot adapted to receive said third leg therethrough.

16. The assembly of claim 15, wherein said first leg, said second leg, and said third leg are disposed to form an E-shaped armature.

17. The assembly of claim 12, wherein said circuit board is attached to said coil via an adhesive.

18. The assembly of claim 12, wherein said coil opening and said circuit board opening are dimensioned so as to permit movement of said first leg of said armature in said coil opening and said opening.

19. The assembly of claim 12, wherein at least a portion of said circuit board is substantially perpendicular to said first leg.

20. An electroacoustic transducer, comprising:

a case;

a transducing assembly disposed in said case, including:

an armature having a first leg;

a coil having a coil opening through which said first leg is received;  
a circuit board attached to said coil, said circuit board having an opening  
through which said first leg is received, said circuit board  
including at least one terminal; and  
a magnet assembly including a first magnet separated from a second  
magnet by a gap, said first leg being received through said gap;  
and  
connecting means for connecting said first leg to a diaphragm disposed in  
said case.

21. The electroacoustic transducer of claim 20 further comprising a pin connected to said at least one terminal of said circuit board, said pin extending through an aperture in said case.
22. The electroacoustic transducer of claim 20, wherein said armature includes a second leg and a third leg, said circuit board includes a first slot disposed along a first outer edge of said circuit board and a second slot disposed along a second outer edge of said circuit board, said first slot receiving said second leg and said second slot receiving said third leg.
23. The electroacoustic transducer of claim 20, wherein said circuit board is substantially perpendicular to said first leg.

24. A method of assembling an electroacoustic transducer assembly, comprising the steps of:

providing a coil having a coil opening;  
attaching a circuit board to said coil, said circuit board having an opening;  
extending an armature leg through said coil opening and said opening; and  
positioning a magnet assembly adjacent to said circuit board such that said armature leg extends through a gap between a first magnet and a second magnet.

25. The method of claim 24, further comprising the step of dimensioning said coil opening, said opening, and said gap so as to permit movement of said armature leg therebetween.

26. A method of positioning a movable armature leg within a coil opening, comprising the steps of:

providing a coil having a coil opening therethrough;  
attaching a circuit board to said coil, said circuit board having an opening therethrough and at least one slot formed along a peripheral edge of said circuit board;  
and  
registering said movable armature leg in said coil opening by passing a support leg through said at least one slot.

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Title: Coil construction for an electroacoustic transducer.

This invention relates to an electroacoustic transducer comprising a case accommodating an armature with at least two armature legs; a coil with an air gap, which coil is fitted with the air gap around an armature leg; a magnetic element with an air gap, which magnetic element is likewise fitted with the air gap around the one armature leg, the air gap of the coil and that of the magnetic element being located substantially in line with each other; a diaphragm; a connecting element which couples a free end of the one armature leg to the diaphragm; and a printed circuit board with terminals for the wires of the coil and for external connections, the coil being attached to the printed circuit board.

Such transducers find application especially, but not exclusively, in hearing aids.

Such a transducer is known, for instance, from WO 91/10243. This publication recognizes the problems in manipulating the lead wires of the coil. These wires are often microscopically thin and must be connected to more robust connecting wires connecting the coil to the further circuits in the hearing aid.

In this prior art reference, it is proposed as a solution to attach the coil, preferably automatically, directly upon winding, to terminal areas of a flexible printed circuit board, whereby first the lead wires of the coil are attached, for instance by welding or soldering, to the terminal areas of the printed circuit board and subsequently a side face of the coil is attached, for instance by adhesion, to the printed circuit board. The printed circuit board further has additional terminal areas to which the external connecting wires can be attached, for instance by soldering.

A flexible printed circuit board has the advantage that it can be laid in the case in any desired manner. It is often also possible, however, to use a printed circuit board from rigid material.

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A problem in existing coil constructions which are not already mounted on a printed circuit board, and in coil constructions which, as in the technique according to WO 91/10243, have already been pre-mounted on a, possibly flexible, printed circuit board, is that positioning the coil with respect to the other parts of the transducer, in particular with respect to the arm of the armature and with respect to the air gap of the magnetic element, is a painstaking, labor-intensive and time-consuming and hence costly activity.

The invention contemplates presenting a solution to this problem and to that end provides a transducer of the above-mentioned type, characterized in that the coil is attached to the printed circuit board by an end face thereof, which is located essentially perpendicularly to the longitudinal axis of the air gap, and that the printed circuit board is provided with an opening which corresponds with the air gap of the coil.

Preferably, the printed circuit board is provided with at least one recess adapted to cooperate with at least one other leg of the armature.

The invention further provides a coil construction for an electromagnetic transducer, comprising a coil with an air gap and a printed circuit board with terminals for wires of the coil and external connections, characterized in that the coil is attached to the printed circuit board by an end face thereof, which is located essentially perpendicularly to the longitudinal axis of the air gap, and that the printed circuit board is provided with an opening which corresponds with the air gap of the coil.

The invention is based on the insight that the printed circuit board can be fixedly connected to the armature and that, as a result, a coil fixedly connected to the printed circuit board can be accurately positioned with respect to the armature. By means of an automatic manufacturing process, for instance as elucidated in WO 91/10243, it is possible to position the coil very accurately with respect to the printed circuit board and to attach it thereto, for instance by means of adhesive. When thereupon the printed

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circuit board can be positioned with respect to the armature very accurately, the position of the coil with respect to the armature is thereby determined very accurately as well. The operation required for this purpose consists in sliding the printed circuit board over the armature, which is an operation 5 which can be performed simply and fast. The invention thus provides an excellent solution to the above-outlined problem.

Hereinbelow, the invention will be further explained on the basis of an exemplary embodiment, with reference to the drawings. In the drawings:

10 Fig. 1 is a cross section of an electromagnetic transducer known per se;

Fig. 2a is a perspective view of a coil mounted on a printed circuit board, for an electromagnetic transducer according to the invention;

15 Fig. 3a is an exploded view of a magnetic body, a coil construction according to the invention, and an armature; and

Fig. 3b shows the parts shown in Fig. 3a in assembled condition.

In elucidation of the use of the coil construction according to the invention in an electroacoustic transducer, Fig. 1 schematically shows a transducer known per se for use in a hearing aid.

20 The transducer comprises a case 1 with an upper case portion 1a and a lower case portion 1b. The interior of the case communicates with the surroundings via a snout 3. In the case, a diaphragm 4 is fitted in such a manner that it can move freely relative to the case, for instance in the manner described in Dutch patent application 1004877. The diaphragm 25 communicates via a so-called reed 5 with the end of a central armature leg 6a of an armature 6. In this case, the armature is E-shaped, as appears more clearly from Fig. 3, but may also be U-shaped.

Provided around the armature leg are a magnet 7, which is accommodated in a pole piece 8, and a coil 9. Both the magnet and the coil 30 have a central opening disposed around the armature leg 6a, such that the

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armature leg can move freely in these openings. Between the coil and the magnet/pole piece combination, an adhesive film 2 is provided to fix these parts with respect to each other. The coil lead wires, not shown, are passed through the case to a printed circuit board 10 with terminals 11 to which 5 the coil lead wires and the external connecting wires can be attached, for instance by soldering.

Electrical signals fed via the lead wires of the coil provide for a movement of the armature leg 6a, which movement is transmitted via the reed to the diaphragm 4, which converts the movement into the sound 10 signals to be perceived via the snout 3.

It will be clear that it is a painstaking and labor-intensive activity to position the coil in the transducer shown in Fig. 1 and to connect the coil wires to the print 10.

Fig. 2 schematically shows a view of the coil construction according 15 to the invention. The core-free coil 9 may be provided, on the circumference thereof, with terminals 12 for the coil lead wires 13a, from which terminals 12 further wires 13b lead to the printed circuit board 14. It is equally possible, however, to connect the coil lead wires 13a directly to the terminal areas 15 on the printed circuit board 14, which may be flexible or rigid, as 20 desired. The coil body 9 is attached, for instance by adhesion, to the printed circuit board through a coil end face, which is located essentially perpendicularly to the longitudinal axis of the central opening in the coil. This can be done with great accuracy in an automatic manner.

The printed circuit board further comprises terminal areas, not 25 shown, for attaching connections to the exterior of the transducer. These further terminal areas are connected through print tracks to the terminal areas 15, or are part thereof.

An elegant solution for providing a connection between the printed circuit board 14 and the exterior of the transducer is to provide pins which 30 at one end are connected, for instance by soldering, to the terminal areas on

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the printed circuit board 14 and which project outside through openings in the case wall to be connected to a printed circuit board present there, having further electronics for signal processing. Such pins can be rigid or slightly flexible and are to be passed, insulated, through the openings 5 provided in the case wall for that purpose. In Fig. 3a two of such pins 18 are schematically shown.

As clearly shown in Figs. 3a and b, the printed circuit board 14 is provided with an opening 16 and recesses 17a, b, while the opening 16 corresponds with the air gap of the coil and can be slid over the armature 10 leg 6a. The opening 16 is so dimensioned that the free movement of the armature leg is not hampered. The recesses 17a and b are slid over the two other legs 6b and 6c of the E-shaped armature 6. Naturally, the recesses 17a, b, instead of being slotted, can also be closed all round or have any other shape that is suitable to be slid over the armature legs 6b, c.

15 The recesses 17a and b fit accurately over the armature legs 6b and 6c, so that the position of the printed circuit board 14 with respect to the armature is very accurate. Because positioning the coil 9 with respect to the printed circuit board can also be done very accurately, the problem of positioning the coil body with respect to the central armature leg has been 20 resolved in a simple manner.

It will be clear that the principle according to the invention is also applicable in U-shaped armatures, that is, an armature where either of the legs 6b or 6c is absent.

It will also be clear that there are other possibilities of accurately 25 positioning the printed circuit board with respect to the armature than by way of recesses 17a and b.

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## CLAIMS

1. An electroacoustic transducer comprising a case accommodating an armature with at least two armature legs; a coil with an air gap, which coil is fitted with the air gap around one armature leg; a magnetic element with an air gap, which magnetic element is likewise fitted with the air gap around the one armature leg, the air gap of the coil and that of the magnetic element being located in line with each other; a diaphragm; a connecting element which couples a free end of the one armature leg to the diaphragm; and a printed circuit board with terminals for the wires of the coil and for external connections, the coil being attached to the printed circuit board, characterized in that the coil is attached to the printed circuit board by an end face thereof, which is located essentially perpendicularly to the longitudinal axis of the air gap, and that the printed circuit board is provided with an opening which corresponds with the air gap of the coil.

5 10 15 20 25 30

15 2. An electroacoustic transducer according to claim 1, characterized in that the printed circuit board is further provided with at least one recess adapted to cooperate with at least one other leg of the armature.

3. An electroacoustic transducer according to claim 2, characterized in that the armature is E-shaped, and that the printed circuit board is provided with two recesses, respectively cooperating with an outer leg of the armature.

20 25 30

4. An electroacoustic transducer according to any one of claims 1-3, characterized in that the coil is glued to the printed circuit board.

25 30

5. An electroacoustic transducer according to any one of claims 1-4, characterized in that for the purpose of external connections, pins are

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connected to the terminal areas on the printed circuit board, which pins project through the wall of the case.

6. A coil construction for an electromagnetic transducer, comprising a coil with an air gap and a printed circuit board with terminals for wires of the coil and external connections, characterized in that the coil is attached to the printed circuit board by an end face thereof which is located essentially perpendicularly to the longitudinal axis of the air gap and that the printed circuit board is provided with an opening which corresponds with the air gap.

7. A coil construction according to claim 6, characterized in that the printed circuit board is provided with at least one recess along the circumferential edge thereof.

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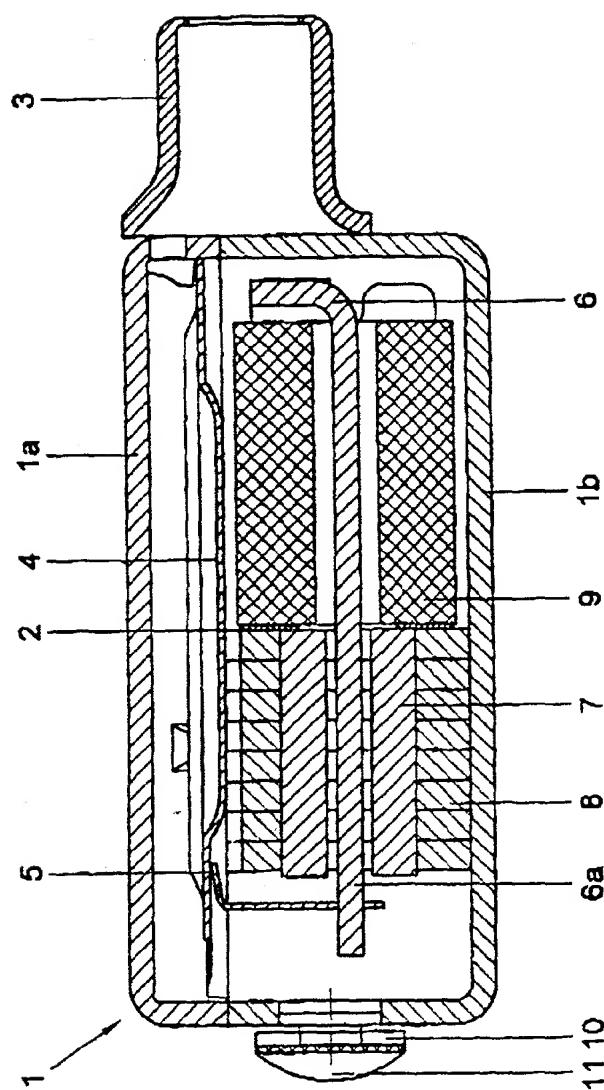


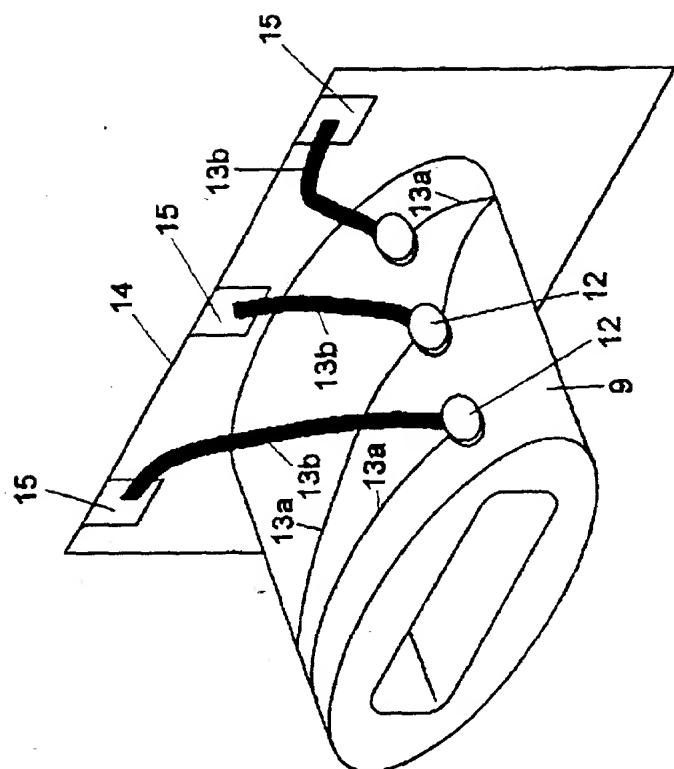
Fig. 1

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Fig. 2



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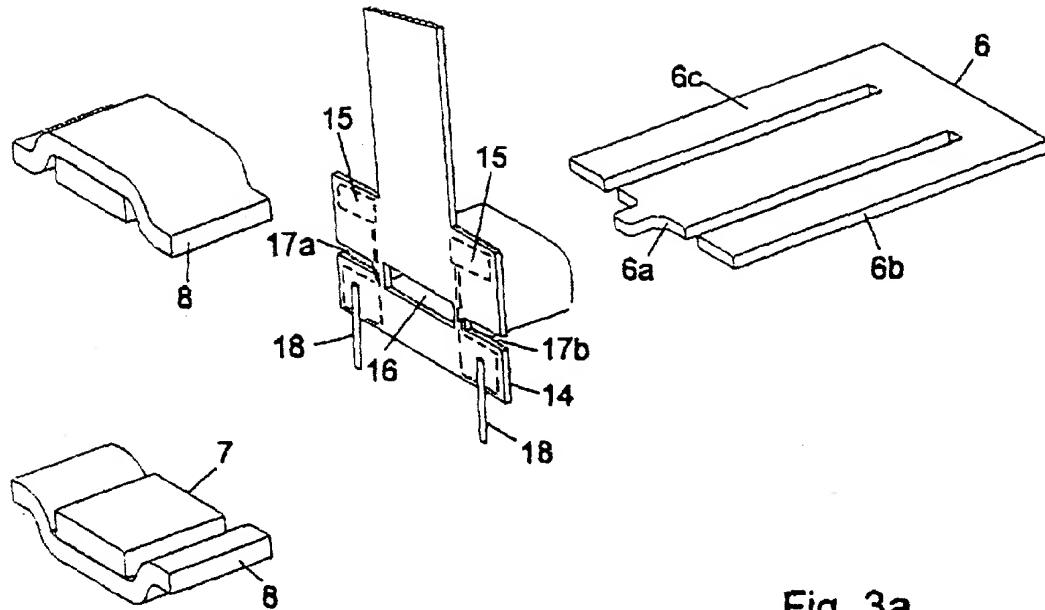


Fig. 3a

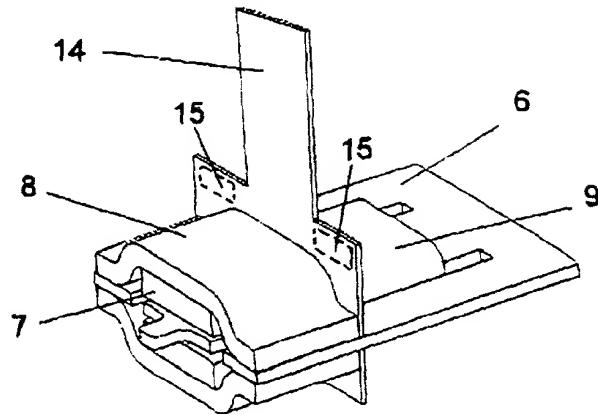


Fig. 3b



PATENT APPLICATION  
ATTNY. DOCKET NO.: 47161-00031USPX

**RULES 63 AND 67 (37 C.F.R. 1.63 and 1.67)**  
**DECLARATION AND POWER OF ATTORNEY**

FOR UTILITY/DESIGN/CIP/PCT NATIONAL APPLICATIONS

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name; and

I believe that I am the **original, first and sole inventor** (if only one name is listed below) or **an original, first and joint inventor** (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **COIL CONSTRUCTION FOR AN ELECTROACOUSTIC TRANSDUCER**, the specification of which: (mark only one)

(a) is attached hereto.

(b) was filed on November 30, 2001, as Application Serial No. 09/980,430 and was amended on \_\_\_\_\_ (if applicable)

(c) was filed as PCT International Application No. \_\_\_\_\_ on \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

(d) was filed on \_\_\_\_\_ as Application Serial No. \_\_\_\_\_ and was issued a Notice of Allowance on \_\_\_\_\_.

(e) was filed on \_\_\_\_\_ and bearing attorney docket number \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above or as allowed as indicated above.

I acknowledge the duty to disclose all information known to me to be material to the patentability of this application as defined in 37 CFR § 1.56. If this is a continuation-in-part (CIP) application, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose to the Office all information known to me to be material to patentability of the application as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

I hereby claim foreign priority benefits under 35 U.S.C. § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which my priority is claimed or, (2) if no priority is claimed, before the filing date of this application:

**PRIOR FOREIGN PATENTS**

<u>Number</u>	<u>Country</u>	<u>Month/Day/ Year Filed</u>	<u>Date first laid- open or Published</u>	<u>Date patented or Granted</u>	<u>Priority Claimed</u>
					<u>Yes</u> <u>No</u>
1012208	Netherlands	06/01/99	12/07/00	N/A	X

I hereby claim the benefit under 35 U.S.C. § 120/365 of any United States application(s) listed below and PCT international applications listed above or below:

PRIOR U.S. OR PCT APPLICATIONS

PCT/NL00/00374 (Application Serial No.)	May 31, 2000 (Filing Date)	Published 12/07/00 WO 00/74436 (Status)
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